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ABSTRACT

To emphasize the interrelated character of psychoeducational variables and educational achievement, a computer program in FORTRAN IV has been written which simulates data by taking population characteristics inputs and projecting a profile of academic functioning. The program enhances the users' diagnostic skills by simulating data in the following major areas: (1) psychological evaluation; (2) sensory screening; (3) personal social behavior; and (4) reading. The text describes the operation of the program while the appendixes provide a copy of the complete program and give several examples of simulated student profiles. (EMH)

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Simulating Psychoeducational Data

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Abstract

A computer program, written in FORTRAN IV, was described which simulates psychoeducational data. The program simulates data relating to the following four major areas: 1) psychological evaluation, 2) sensory screening, 3) personal-social behavior, and 4) reading. The operation of the program is discussed and several examples of simulated student profiles are given.

In the past decade there has been a great effort by educators to assess and prescribe for individual learning problems. One reason for this emphasis has been the realization by professionals that performance (e.g., reading, specific psycholinguistic skills) and not labels (e.g., mentally retarded, brain-injured) must be the basis for assisting children having academic difficulties. Although the interest and energy expended in learning disabilities is evident, there has been a dearth of research conducted to determine efficient and valid techniques for diagnosing learning problems. To a large extent much of this difficulty stems from a failure to consider the complex interrelationship which characterizes data (IQ scores, achievement scores, etc.) accumulated for a given child. A perusal of texts relating to the diagnosis and remediation of learning disabilities quickly reveals the high priority given to the administration of tests and data collection - often ad infinitum - but little attention paid to the all important questions of interpreting such data. The purpose of the present paper was to describe a computer program which simulates data relevant to academic functioning according to specified parameters (i.e., data drawn from populations having specified means, standard deviations and intercorrelations). The use of this program demands that the interrelationship between variables be given serious consideration. With judicious use this program may serve as a vehicle by which the diagnostic process can be taught, studied and experimented with in detail.

Program Description

The complete FORTRAN IV program for simulating psycho-educational data is presented in Appendix A. The program reads 1 control card, 1 card specifying variable means, 1 card specifying variable standard deviations, and either 0 or 11 factor cards. The input order for specifying population means and standard deviations and for reading factor loadings for the 11 primary variables is as follows:

1. VERBAL IQ
2. PERFORMANCE IQ
3. HEARING
4. VISION
5. SPEECH
6. ATTENTION
7. ACTIVITY LEVEL
8. SOCIAL ACCEPTANCE
9. WORD ANALYSIS (READING)
10. VOCABULARY (READING)
11. COMPREHENSION (READING)

Following the input cards, a vector of normal random numbers (drawn from a population having 0 means and standard deviations of 1) is generated using subroutines GAUSS and RANDU. These subroutines are available in the IBM System/360 Scientific Subroutine

Package (1970). If factor loadings have been specified on the control card, the factor matrix is postmultiplied by the vector of normal random numbers thereby producing a vector of scores drawn from a multivariate having means of 0 standard deviations of 1 and correlations R. The correlations between the 11 primary variables, as represented in the correlation matrix R, provide the data from which the factor loadings are determined. The correlations between variables is hypothesized by the user or based on available empirical information. The procedure for producing a sample drawn "from a multivariate population with zero means, unit standard deviations and correlations R" has been succinctly described by Kaiser and Dickman (1962).

If 0 factor cards have been specified on the control card, the result will be simulated variables drawn from a population having intercorrelations of 0.0.

After scores have been generated from a population having the desired intercorrelations, each score is transformed using the previously specified population means and standard deviations using the following formula:

$$SCORE_i = z_i * SD_i + MEAN$$

where the subscript i represents the variable number.

The following information is then calculated: FULL SCALE IQ, 2) CHRONOLOGICAL AGE in months and years, and 3) GRADE LEVEL.

The Wechsler Intelligence Scale for Children (Wechsler, 1949) provided the basis for determining the regression coefficients for estimating FULL SCALE IQ. The formula for estimating FULL SCALE IQ is as follows: (VERBAL IQ + PERFORMANCE IQ) / 2.0 * 1.09 - 9.54. CHRONOLOGICAL AGE was determined by first using WORD ANALYSIS, VOCABULARY and COMPREHENSION scores to provide an estimate of mental ability (EMA). CHRONOLOGICAL AGE was then determined using the following formula: CA = EMA/FULL SCALE IQ * 100.0. GRADE LEVEL is simply CHRONOLOGICAL AGE - 5.0.

After the above data has been generated, HEARING, VISION, AND SPEECH are set to either PASS or FAIL depending on the values specified on the control card. As an example, if HEARING is set to have a mean of 50.0 and a standard deviation of 10.0, and 40.0 is specified as the HEARING cutoff value, then all hearing scores less than 40.0 will be set to FAIL and all others will be set to PASS.

Appendices B, C, and D provide samples of simulated student profiles for three separate models. Appendix B represents profiles drawn from a population having intercorrelations of 0.0. Appendix C illustrates simulated student profiles drawn from a population having intercorrelations of 0.50. Appendix D shows simulated student profiles drawn from a population having heterogeneous intercorrelations.

After the number of student profiles specified on the control card have been generated, the following statistic are then provided for the 11 primary variables: 1) means and standard deviations specified by the user, 2) means and standard deviations of the sample generated, 3) product-moment correlations between simulated variables, 4) correlations between variables as determined from the factor matrix, and 5) the factor loadings specified by the user.

Input Card Description: (a through f are right-justified)

1. CONTROL CARD:

   a. COLS: 1-5 = number of profiles

   b. COLS: 6-10 = number of factor loadings on each factor card. (If greater than 0, 11 factor cards will be read. If 0, no factor cards will be read.)

   c. COLS: 11-15 = cutoff value for hearing

   d. COLS: 16-20 = cutoff value for vision

   e. COLS: 21-25 = cutoff value for speech

   f. COLS: 26-35 = seed value for random generator

   g. COLS: 36-79 = alphameric description of job

2. VARIABLE MEAN CARD: Variable means desired by the user are punched, right-justified, in fields of 7 in the order previously mentioned. Example: COLS: 1-7 = VERBAL IQ mean, COLS: 8-14 = PERFORMANCE IQ mean, etc. WORD ANALYSIS, VOCABULARY and COMPREHENSION should be expressed as grade equivalents (e.g., 2.0, 4.1).

3. VARIABLE STANDARD DEVIATION CARD: Standard deviations desired by the user are punched, right-justified, in fields of 7 in the order previously specified. Example: COLS: 1-7 = VERBAL IQ standard deviation, COLS: 8 -14 = PERFORMANCE IQ standard deviation.

4. FACTOR LOADING CARDS (optional): Factor values are punched, right justified, in fields of 6.

Discussion:

The program presented in the present paper is based on a limited number of variables. The possibilities, however, of expanding this program provides great flexibility for creating a vast array of data according to a previously defined model. As an example by increasing the number of variables and adding a temporal dimension (e.g., achievement over a period of years) simulated data profiles can be both realistic and extensive while at the same time providing an efficient and controlled method for generating and investigating an array of variables.

There is no doubt that the generation of simulated data does not take the place of actual diagnostic experience. As Lerner and Schuyler (1974) have suggested, simulation can provide a link between theory and clinical experience. As a teaching device, simulated data profiles can be used to develop skills in score interpretation, profile analysis and the interpretation of

learning discrepancies, (i.e., auditory deficits versus perceptual deficits).

The simulation of psychoeducational data can be a useful method for conceptualizing variables which might affect academic functioning. Through computer simulation it may be possible to establish a concrete nexus between diagnosis, remediation and academic progress. Models have been developed in such fields as medicine and economics which allow one to assess the affects of a given prediction. There is no reason why a similar model, utilizing and interrrelating pertinent research, cannot be developed which can evaluate the affect a psychoeducational diagnosis, and the ensuing prescription, has on the social-academic future of a child. The simulation program presented in the present paper is an initial step toward this goal.

References

Kaiser, H., and Dickman, K. Sample and population score matrices and sample correlation matrices from an arbitrary population corelation matrix. Psychometrika, 1962, 27, 179-182.

Lerner, J., and Schuyler, J. Computer simulation: a technique for training educational diagnosticians. Journal of Learning Disabilities, 1974, 7, 471-476.

Wechsler, D. Wechsler Intelligence Scale for Children: Harval. New York, Psychological Corporation, 1949.

IBM System/360 Scientific Subroutine Package. (5th ed.) Version III, Programmer's Manual, Program Number 360A-CM-03X, 1970.

Appendix A

```
C
C  VARIABLES: X(1)=VERBAL IQ, X(2)=PERFORMANCE IQ, X(3)=HEARING, X(4)=
C    VISION, X(5)=SPEECH, X(6)=ATTENTION, X(7)=ACTIVITY, X(8)=SOCIAL,
C    X(9)=WORD ANALYSIS, X(10)=VOCABULARY, X(11)=COMPREHENSION.
C
      DIMENSION FACT(11,11),RAND(11),X(11),NX(11),XMEAN(11),STAND(11),
     ADES(11),XSUM(11),R(11,11),SD(11)
      DATA FAIL, PASS/'FAIL', 'PASS'/
      NV=11
C
C  READ CONTROL CARDS:
C    CARD 1: COLS. 1 - 5 = NUMBER OF SIMULATED CASES DESIRED; COLS. 6 -
C    10 = NUMBER OF FACTORS IN FACTOR MATRIX (IF NF EQUALS 0 THEN RANDOM
C    NUMBERS WILL BE INSERTED IN EACH SCORE VECTOR); COLS. 11 - 15 =
C    HEARING CUTOFF; COLS. 16 - 20 = VISION CUTOFF; COLS. 21 - 25 =
C    SPEECH CUTOFF; COLS. 26 - 35 = SEED VALUE FOR RANDOM NUMBER
C    GENERATOR; COLS. 36 - 79 = ALPHAMERIC DESCRIPTION.
C    CARD 2: DESIRED MEANS FOR EACH SCORE VECTOR.
C    CARD 3: DESIRED STANDARD DEVIATIONS FOR EACH SCORE VECTOR.
C    CARDS 4 THROUGH 14 (OPTIONAL): FACTOR SCORES.
C
    1 READ(5,2,END=60) NSUB,NF,HEACUT,VISCUT,SPECUT,IX,(DES(I),I=1,NV)
    2 FORMAT(2I5, 3F5.0, I10, 11A4).
      XSUB=NSUB
      READ(5,3) (XMEAN(I), I=1,NV)
      READ(5,3) (STAND(I), I=1,NV)
    3 FORMAT(11F7.0)
      IF(NF .EQ. 0) GO TO 6
      DO 5 I=1,NV
      READ(5,4) (FACT(I,J), J=1,NF)
    4 FORMAT(11F6.0)
    5 CONTINUE
    6 CONTINUE
      DO 7 I=1,NV
      DO 7 J=1,NV
      XSUM(I)=0.0
    7 R(I,J)=0.0
C
C  DETERMINE VECTOR SCORES AND SET MEANS AND STANDARD DEVIATIONS.
      DO 22 IFIN=1,NSUB
      IF(NF .EQ. 0) GO TO 12
      DO 10 I=1,NF
   10 CALL GAUSS(IX, 1.0, 0.0, RAND(I))
      DO 11 I=1,NV
      X(I)=0.0
      DO 11 J=1,NF
   11 X(I)=X(I) + FACT(I,J) * RAND(J)
      GO TO 14
   12 CONTINUE
      DO 13 I=1,NV
      CALL GAUSS(IX, 1.0, 0.0, X(I))
   13 FACT(I,1)=0.0
   14 CONTINUE
```

```
      DO 15 I=1,NV
      X(I)=X(I) * STAND(I) + XMEAN(I)
      IF(X(I) .LT. 0.0) X(I)=0.0
   15 NX(I)=X(I)
C
C  DETERMINE FULL SCALE IQ, CHRONOLOGICAL AGE, AND GRADE LEVEL.
      NIQ=(X(1) + X(2)) / 2.0 * 1.09 - 9.54
      TMA=(X(9) * 4.0 + X(10) * 4.0 + X(11) * 4.0) + 60.0
      CA= TMA / NIQ * 100.0
      NCA=CA
      NYEAR=CA / 12.0
      NYEAR=NYEAR * 12
      MONTH=NCA - NYEAR
      NYEAR=NYEAR / 12
      NGRADE=CA / 12.0 - 5.0
      IF(NGRADE .LT. 0) NGRADE=0
C
C  SET HEARING, VISION AND SPEECH TO PASS/FAIL.
      HEAR=PASS
      IF(X(3) .LT. HEACUT) HEAR=FAIL
      VISION=PASS
      IF(X(4) .LT. VISCUT) VISION=FAIL
      SPEECH=PASS
      IF(X(5) .LT. SPECUT) SPEECH=FAIL
      DO 20 I=1,8
   20 X(I)=NX(I)
C
C  CALCULATE SUMS OF X AND OUTPUT PROFILES.
      DO 30 I=1,NV
      XSUM(I)=XSUM(I) + X(I)
      DO 30 J= I,NV
   30 R(I,J)=R(I,J) + X(I) * X(J)
      WRITE(6,31) (DES(I), I=1,NV), IFIN, NYEAR, MONTH, NGRADE, NX(1),
     AHEAR, NX(2), VISION, NIQ, SPEECH, NX(6), X(9), NX(7), X(10),
     BNX(8), X(11)
   31 FORMAT('1', 14(/), 15X, 11A4////
     A15X, 'THE NUMBER OF THIS DATA PROFILE IS', I4//
     B15X, 'CHRONOLOGICAL AGE IS ', I3, ' YEARS AND ', I3, ' MONTH(S)'//
     C15X, 'GRADE LEVEL IS', I4////
     D15X, 'PSYCHOLOGICAL', 9X, 'SCREENING'///
     E16X, 'VERBAL IQ ', I4, 8X, 'HEARING   ', A4//
     F16X, 'PERFORMANCE IQ ', I4, 3X, 'VISION   ', A4//
     G16X, 'FULL SCALE IQ ', I4, 4X, 'SPEECH   ', A4////
     H15X, 'PERSONAL-SOCIAL', 7X, 'READING'///
     I16X, 'ATTENTION ', I4, 8X, 'WORD ANALYSIS', F5.1//
     J16X, 'ACTIVITY ', I4, 9X, 'VOCABULARY', F5.1//
     K16X, 'SOCIAL ', I4, 11X, 'COMPREHENSION', F5.1)
   32 CONTINUE
C
C  CALCULATE MEANS, STANDARD DEVIATIONS AND CORRELATIONS.
```

```
      IF(NF .EQ. 0) NF=1
      DO 40 I=1,NV
      SD(I)=SQRT(R(I,I) - XSUM(I)**2 / XSUB) / XSUB)
   40 XSUM(I)=XSUM(I) / XSUB
      DO 41 I=1,NV
      DO 41 J=I,NV
      R(I,J)=(R(I,J) / XSUB - XSUM(I) * XSUM(J)) / (SD(I) * SD(J))
      R(J,I)=R(I,J)
      R(I,J)=0.0
      DO 41 K=1,NF
   41 R(I,J)=R(I,J) + FACT(I,K) * FACT(J,K)
C
C  OUTPUT SAMPLE STATISTICS.
      WRITE(6,51) NSUB, NF
   51 FORMAT('1',13X,'NUMBER OF PROFILES GENERATED = ',I5//10X,'NUMBER O
     AF FACTORS USED TO GENERATE PROFILES = ', I5/// 10X, 'VARIABLE', 6X,
     B'MEAN IN', 5X, 'SD IN', 5X, 'MEAN OUT', 4X, 'SD OUT'//)
      DO 53 I=1,NV
      WRITE(6,52) I, XMEAN(I), STAND(I), XSUM(I), SD(I)
   52 FORMAT(12X, I3, 5X, 4F11.3//)
   53 CONTINUE
      WRITE(6,54)
   54 FORMAT('1',10X, 'CORRELATION MATRIX: UPPER TRIANGLE CONTAINS FACTO
     AR'/10X, 'DERIVED CORRELATIONS AND LOWER TRIANGLE CONTAINS'/10X,
     B'DATA DERIVED CORRELATIONS.'//)
      DO 56 I=1,NV
      WRITE(6,55) I, (R(I,J), J=1,NV)
   55 FORMAT(13X, I3, 5X, 11F6.2//)
   56 CONTINUE
      WRITE(6,57)
   57 FORMAT('1', 10X, 'FACTOR SCORE INPUT'//)
      DO 59 I=1,NV
      WRITE(6,58) I, (FACT(I,J), J=1,NF)
   58 FORMAT(13X, I3, 5X, 11F6.2//)
   59 CONTINUE
      GO TO 1
   60 STOP
      END
```

Sample Input Data

```
Appendix B
   10     0    40    40    40 756213152      SIMULATION WITH RANDOM NUMBERS
    100     100      50      50      50       5       5       5     2.0     2.0     2.0
     15      15      10      10      10       2       2       2     1.0     1.0     1.0

Appendix C
   10    11    40    40    40 213548321      SIMULATION FACTOR MODEL 1
    100     100      50      50      50       5       5       5     2.0     2.0     2.0
     15      15      10      10      10       2       2       2     1.0     1.0     1.0
 0.739 0.155-0.500 0.012 0.004-0.013 0.012 0.049 0.016-0.217-0.361
 0.739 0.155 0.500 0.012 0.004-0.013 0.012 0.049 0.016-0.217-0.361
 0.739-0.345 0.000-0.166 0.483 0.005-0.024 0.265-0.064 0.004 0.007
 0.739-0.318 0.000-0.153-0.517 0.004-0.022 0.243-0.059 0.003 0.007
 0.739-0.246 0.000 0.617 0.004 0.003-0.017-0.104 0.046 0.003 0.026
 0.739-0.124 0.000-0.185 0.004 0.001 0.491-0.382 0.127 0.001 0.037
 0.739-0.054 0.000-0.184 0.004 0.001-0.506-0.381 0.124 0.001 0.033
 0.739 0.164 0.000 0.012 0.004-0.002 0.013-0.110-0.616-0.050 0.184
 0.739 0.212 0.000 0.012 0.004-0.487 0.014 0.158 0.205-0.082 0.314
 0.739 0.222 0.000 0.012 0.004 0.512 0.014 0.151 0.193-0.073 0.277
 0.739 0.179 0.000 0.012 0.004-0.013 0.013 0.062 0.012 0.623-0.162

Appendix D
   10    11    40    40    40 546213921      SIMULATION FACTOR MODEL 2
    100     100      50      50      50       5       5       5     2.0     2.0     2.0
     15      15      10      10      10       2       2       2     1.0     1.0     1.0
 0.754 0.257 0.143-0.381-0.112 0.196-0.143 0.036-0.042 0.264 0.235
 0.663 0.042-0.113-0.608 0.157-0.256 0.123-0.047 0.043 0.083-0.246
 0.447 0.307 0.623 0.368-0.258 0.154 0.006 0.074 0.177 0.108-0.207
 0.499-0.149-0.513 0.434 0.358 0.054 0.189 0.110 0.222 0.219 0.028
 0.315-0.027 0.726 0.054 0.543-0.137 0.201-0.032-0.064-0.090 0.114
 0.512-0.534 0.092 0.058-0.435-0.412 0.128-0.017 0.220-0.043 0.126
 0.330-0.715 0.128 0.097 0.180-0.023-0.555 0.014-0.073 0.052-0.075
```

Sample Input Data

```
0.366-0.682 0.033-0.155-0.105 0.491 0.315-0.008-0.122-0.087-0.044
0.692 0.160-0.173 0.338-0.144-0.188 0.083 0.027-0.535 0.022-0.030
0.766 0.263-0.177-0.058 0.043 0.067-0.134 0.410 0.105-0.322 0.019
0.721 0.236-0.181 0.134 0.029 0.119-0.114-0.555 0.110-0.160 0.016
```

Appendix B

SIMULATION WITH RANDOM NUMBERS

THE NUMBER OF THIS DATA PROFILE IS 1
CHRONOLOGICAL AGE IS 5 YEARS AND 6 MONTH(S)
GRADE LEVEL IS 0

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	118	HEARING	PASS
PERFORMANCE IQ	109	VISION	PASS
FULL SCALE IQ	114	SPEECH	FAIL

PERSONAL-SOCIAL		READING	
ATTENTION	3	WORD ANALYSIS	2.3
ACTIVITY	3	VOCABULARY	1.6
SOCIAL	1	COMPREHENSION	0.?

SIMULATION WITH RANDOM NUMBERS

THE NUMBER OF THIS DATA PROFILE IS 2

CHRONOLOGICAL AGE IS 8 YEARS AND 5 MONTH(S)

GRADE LEVEL IS 3

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	100	HEARING	PASS
PERFORMANCE IQ	67	VISION	PASS
FULL SCALE IQ	82	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	4	WORD ANALYSIS	2.0
ACTIVITY	6	VOCABULARY	1.2
SOCIAL	6	COMPREHENSION	2.5

SIMULATION WITH RANDOM NUMBERS

THE NUMBER OF THIS DATA PROFILE IS 3

CHRONOLOGICAL AGE IS 6 YEARS AND 10 MONTH(S)

GRADE LEVEL IS 1

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	78	HEARING	PASS
PERFORMANCE IQ	102	VISION	PASS
FULL SCALE IQ	89	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	4	WORD ANALYSIS	0.6
ACTIVITY	7	VOCABULARY	2.6
SOCIAL	6	COMPREHENSION	0.1

SIMULATION WITH RANDOM NUMBERS

THE NUMBER OF THIS DATA PROFILE IS 4

CHRONOLOGICAL AGE IS 7 YEARS AND 0 MONTH(S)

GRADE LEVEL IS 2

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	110	HEARING	PASS
PERFORMANCE IQ	109	VISION	PASS
FULL SCALE IQ	110	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	5	WORD ANALYSIS	3.2
ACTIVITY	3	VOCABULARY	2.0
SOCIAL	6	COMPREHENSION	3.0

SIMULATION WITH RANDOM NUMBERS

THE NUMBER OF THIS DATA PROFILE IS 5

CHRONOLOGICAL AGE IS 7 YEARS AND 9 MONTH(S)

GRADE LEVEL IS 2

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	79	HEARING	PASS
PERFORMANCE IQ	106	VISION	PASS
FULL SCALE IQ	91	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	3	WORD ANALYSIS	2.1
ACTIVITY	4	VOCABULARY	0.8
SOCIAL	7	COMPREHENSION	1.4

SIMULATION WITH RANDOM NUMBERS

THE NUMBER OF THIS DATA PROFILE IS 6

CHRONOLOGICAL AGE IS 5 YEARS AND 6 MONTH(S)

GRADE LEVEL IS 0

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	123	HEARING	PASS
PERFORMANCE IQ	107	VISION	PASS
FULL SCALE IQ	116	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	3	WORD ANALYSIS	1.7
ACTIVITY	2	VOCABULARY	1.2
SOCIAL	5	COMPREHENSION	1.6

SIMULATION WITH RANDOM NUMBERS

THE NUMBER OF THIS DATA PROFILE IS 7

CHRONOLOGICAL AGE IS 5 YEARS AND 11 MONTH(S)

GRADE LEVEL IS 0

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	103	HEARING	FAIL
PERFORMANCE IQ	105	VISION	FAIL
FULL SCALE IQ	104	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	7	WORD ANALYSIS	0.0
ACTIVITY	5	VOCABULARY	0.0
SOCIAL	5	COMPREHENSION	2.7

SIMULATION WITH RANDOM NUMBERS

THE NUMBER OF THIS DATA PROFILE IS 8

CHRONOLOGICAL AGE IS 7 YEARS AND 3 MONTH(S)

GRADE LEVEL IS 2

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	93	HEARING	PASS
PERFORMANCE IQ	91	VISION	PASS
FULL SCALE IQ	91	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	2	WORD ANALYSIS	1.9
ACTIVITY	1	VOCABULARY	3.3
SOCIAL	5	COMPREHENSION	2.8

SIMULATION WITH RANDOM NUMBERS

THE NUMBER OF THIS DATA PROFILE IS 9

CHRONOLOGICAL AGE IS 6 YEARS AND 10 MONTH(S)

GRADE LEVEL IS 1

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	105	HEARING	PASS
PERFORMANCE IQ	100	VISION	PASS
FULL SCALE IQ	102	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	4	WORD ANALYSIS	2.6
ACTIVITY	3	VOCABULARY	0.2
SOCIAL	4	COMPREHENSION	3.1

SIMULATION WITH RANDOM NUMBERS

THE NUMBER OF THIS DATA PROFILE IS 10

CHRONOLOGICAL AGE IS 7 YEARS AND 1 MONTH(S)

GRADE LEVEL IS 2

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	110	HEARING	PASS
PERFORMANCE IQ	80	VISION	PASS
FULL SCALE IQ	94	SPEECH	FAIL

PERSONAL-SOCIAL		READING	
ATTENTION	9	WORD ANALYSIS	0.3
ACTIVITY	4	VOCABULARY	3.1
SOCIAL	7	COMPREHENSION	1.5

NUMBER OF PROFILES GENERATED = 10

NUMBER OF FACTORS USED TO GENERATE PROFILES = 1

VARIABLE	MEAN IN	SD IN	MEAN OUT	SD OUT
1	100.000	15.000	101.900	14.230
2	100.000	15.000	97.600	13.373
3	50.000	10.000	51.400	9.265
4	50.000	10.000	48.300	8.271
5	50.000	10.000	49.300	9.644
6	5.000	2.000	4.100	2.335
7	5.000	2.000	3.800	1.720
8	5.000	2.000	5.200	1.561
9	2.000	1.000	1.765	0.345
10	2.000	1.000	1.304	0.979
11	2.000	1.000	1.861	1.100

CORRELATION MATRIX: UPPER TRIANGLE CONTAINS FACTOR DERIVED CORRELATIONS AND LOWER TRIANGLE CONTAINS DATA DERIVED CORRELATIONS.

1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.09	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	-0.16	-0.47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.14	-0.54	0.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	-0.62	0.30	-0.46	-0.66	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.37	-0.30	-0.18	0.24	-0.13	0.0	0.0	0.0	0.0	0.0	0.0
7	-0.48	-0.23	0.41	0.05	0.23	0.27	0.0	0.0	0.0	0.0	0.0
8	-0.49	-0.37	0.20	0.09	0.21	0.17	0.33	0.0	0.0	0.0	0.0
9	0.22	0.27	0.21	-0.26	-0.05	-0.51	-0.46	-0.33	0.0	0.0	0.0
10	0.06	-0.17	0.52	0.65	-0.57	0.41	0.33	0.26	-0.35	0.0	0.0
11	0.14	-0.22	-0.24	-0.29	0.36	0.18	-0.31	0.24	0.39	-0.55	0.0

FACTOR SCORE INPUT

1	0.0
2	0.0
3	0.0
4	0.0
5	0.0
6	0.0
7	0.0
8	0.0
9	0.0
10	0.0
11	0.0

Appendix C

SIMULATION FACTOR MODEL 1

THE NUMBER OF THIS DATA PROFILE IS 1
CHRONOLOGICAL AGE IS 7 YEARS AND 9 MONTH(S)
GRADE LEVEL IS 2

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	104	HEARING	PASS
PERFORMANCE IQ	85	VISION	PASS
FULL SCALE IQ	94	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	4	WORD ANALYSIS	2.6
ACTIVITY	5	VOCABULARY	2.6
SOCIAL	5	COMPREHENSION	1.8

SIMULATION FACTOR MODEL 1

THE NUMBER OF THIS DATA PROFILE IS 2

CHRONOLOGICAL AGE IS 7 YEARS AND 2 MONTH(S)

GRADE LEVEL IS 2

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	87	HEARING	PASS
PERFORMANCE IQ	101	VISION	PASS
FULL SCALE IQ	93	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	5	WORD ANALYSIS	1.5
ACTIVITY	3	VOCABULARY	1.6
SOCIAL	6	COMPREHENSION	1.9

SIMULATION FACTOR MODEL 1

THE NUMBER OF THIS DATA PROFILE IS 3

CHRONOLOGICAL AGE IS 7 YEARS AND 5 MONTH(S)

GRADE LEVEL IS 2

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	112	HEARING	PASS
PERFORMANCE IQ	97	VISION	PASS
FULL SCALE IQ	104	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	6	WORD ANALYSIS	2.2
ACTIVITY	6	VOCABULARY	2.9
SOCIAL	7	COMPREHENSION	3.2

SIMULATION FACTOR MODEL 1

THE NUMBER OF THIS DATA PROFILE IS 4
CHRONOLOGICAL AGE IS 6 YEARS AND 8 MONTH(S)
GRADE LEVEL IS 1

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	104	HEARING	PASS
PERFORMANCE IQ	96	VISION	PASS
FULL SCALE IQ	99	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	2	WORD ANALYSIS	2.1
ACTIVITY	5	VOCABULARY	1.2
SOCIAL	5	COMPREHENSION	1.5

SIMULATION FACTOR MODEL 1

THE NUMBER OF THIS DATA PROFILE IS 5 *

CHRONOLOGICAL AGE IS 6 YEARS AND 7 MONTH(S)

GRADE LEVEL IS 1

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	106	HEARING	PASS
PERFORMANCE IQ	90	VISION	PASS
FULL SCALE IQ	97	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	6	WORD ANALYSIS	0.2
ACTIVITY	3	VOCABULARY	1.9
SOCIAL	6	COMPREHENSION	2.2

SIMULATION FACTOR MODEL 1

THE NUMBER OF THIS DATA PROFILE IS 6

CHRONOLOGICAL AGE IS 6 YEARS AND 3 MONTH(S)

GRADE LEVEL IS 1

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	114	HEARING	PASS
PERFORMANCE IQ	115	VISION	PASS
FULL SCALE IQ	115	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	5	WORD ANALYSIS	1.6
ACTIVITY	6	VOCABULARY	3.0
SOCIAL	7	COMPREHENSION	2.1

SIMULATION FACTOR MODEL 1

THE NUMBER OF THIS DATA PROFILE IS 7

CHRONOLOGICAL AGE IS 8 YEARS AND 2 MONTH(S)

GRADE LEVEL IS 3

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	94	HEARING	PASS
PERFORMANCE IQ	84	VISION	PASS
FULL SCALE IQ	88	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	4	WORD ANALYSIS	2.6
ACTIVITY	3	VOCABULARY	1.2
SOCIAL	5	COMPREHENSION	2.4

SIMULATION FACTOR MODEL 1

THE NUMBER OF THIS DATA PROFILE IS 9

CHRONOLOGICAL AGE IS 5 YEARS AND 11 MONTH(S)

GRADE LEVEL IS 0

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	102	HEARING	PASS
PERFORMANCE IQ	109	VISION	PASS
FULL SCALE IQ	106	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	4	WORD ANALYSIS	2.0
ACTIVITY	5	VOCABULARY	3.7
SOCIAL	6	COMPREHENSION	1.4

SIMULATION FACTOR MODEL 1

THE NUMBER OF THIS DATA PROFILE IS 9

CHRONOLOGICAL AGE IS 8 YEARS AND 0 MONTH(S)

GRADE LEVEL IS 3

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	72	HEARING	PASS
PERFORMANCE IQ	83	VISION	FAIL
FULL SCALE IQ	75	SPEECH	FAIL

PERSONAL-SOCIAL		READING	
ATTENTION	1	WORD ANALYSIS	0.4
ACTIVITY	3	VOCABULARY	1.2
SOCIAL	1	COMPREHENSION	1.5

SIMULATION FACTOR MODEL 1

THE NUMBER OF THIS DATA PROFILE IS 10

CHRONOLOGICAL AGE IS 7 YEARS AND 2 MONTH(S)

GRADE LEVEL IS 2

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	97	HEARING	PASS
PERFORMANCE IQ	93	VISION	PASS
FULL SCALE IQ	94	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	2	WORD ANALYSIS	2.5
ACTIVITY	5	VOCABULARY	1.9
SOCIAL	6	COMPREHENSION	1.7

NUMBER OF PROFILES GENERATED = 10

NUMBER OF FACTORS USED TO GENERATE PROFILES = 11

VARIABLE	MEAN IN	SD IN	MEAN OUT	SD OUT
1	100.000	15.000	99.200	11.347
2	100.000	15.000	95.300	10.150
3	50.000	10.000	48.300	6.165
4	50.000	10.000	46.700	7.281
5	50.000	10.000	49.200	7.411
6	5.000	2.000	3.900	1.640
7	5.000	2.000	4.400	1.200
8	5.000	2.000	5.400	1.435
9	2.000	1.000	1.783	0.831
10	2.000	1.000	1.806	0.742
11	2.000	1.000	1.901	0.535

CORRELATION MATRIX: UPPER TRIANGLE CONTAINS FACTOR DERIVED CORRELATIONS AND LOWER TRIANGLE CONTAINS DATA DERIVED CORRELATIONS.

1	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.5
2	0.50	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.5
3	0.40	0.34	1.00	0.50	0.50	0.51	0.50	0.50	0.50	0.50	0.5
4	0.82	0.30	0.58	1.00	0.50	0.50	0.50	0.50	0.50	0.50	0.5
5	0.65	0.43	0.46	0.63	1.00	0.51	0.50	0.50	0.50	0.50	0.5
6	0.61	0.35	0.56	0.65	0.73	1.00	0.50	0.50	0.51	0.50	0.5
7	0.73	0.56	0.19	0.62	0.34	0.12	1.00	0.50	0.50	0.50	0.5
8	0.83	0.63	0.55	0.82	0.87	0.73	0.53	1.00	0.50	0.50	0.5
9	0.32	0.04	0.09	0.64	0.13	-0.06	0.50	0.37	1.00	0.50	0.5
10	0.59	0.18	0.47	0.67	0.38	0.50	0.56	0.48	0.13	1.00	0.5
11	0.39	-0.01	0.62	0.55	0.37	0.74	0.19	0.35	-0.02	0.50	1.00

FACTOR SCORE INPUT

1	0.74	0.15	-0.50	0.01	0.00	-0.01	0.01	0.05	0.02	-0.22	-0.36
2	0.74	0.15	0.50	0.01	0.00	-0.01	0.01	0.05	0.02	-0.22	-0.36
3	0.74	-0.35	0.0	-0.17	0.48	0.00	-0.02	0.26	-0.06	0.00	0.01
4	0.74	-0.32	0.0	-0.15	-0.52	0.00	-0.02	0.24	-0.06	0.00	0.01
5	0.74	-0.25	0.0	0.62	0.00	0.00	-0.02	-0.10	0.05	0.00	0.03
6	0.74	-0.12	0.0	-0.19	0.00	0.00	0.49	-0.28	0.12	0.00	0.04
7	0.74	-0.05	0.0	-0.18	0.00	0.00	-0.51	-0.38	0.12	0.00	0.03
8	0.74	0.16	0.0	0.01	0.00	-0.00	0.01	-0.11	-0.62	-0.05	0.18
9	0.74	0.21	0.0	0.01	0.00	-0.49	0.01	0.16	0.20	-0.08	0.31
10	0.74	0.22	0.0	0.01	0.00	0.51	0.01	0.15	0.19	-0.07	0.28
11	0.74	0.18	0.0	0.01	0.00	-0.01	0.01	0.06	0.01	0.62	-0.16

Appendix D

SIMULATION FACTOR MODEL 2

THE NUMBER OF THIS DATA PROFILE IS 1

CHRONOLOGICAL AGE IS 7 YEARS AND 3 MONTH(S)

GRADE LEVEL IS 2

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	104	HEARING	PASS
PERFORMANCE IQ	81	VISION	PASS
FULL SCALE IQ	91	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	2	WORD ANALYSIS	2.3
ACTIVITY	3	VOCABULARY	1.7
SOCIAL	4	COMPREHENSION	1.2

SIMULATION FACTOR MODEL 2

THE NUMBER OF THIS DATA PROFILE IS 2

CHRONOLOGICAL AGE IS 6 YEARS AND 6 MONTH(S)

GRADE LEVEL IS 1

PSYCHOLOGICAL SCREENING

VERBAL IQ	108	HEARING	PASS
PERFORMANCE IQ	100	VISION	PASS
FULL SCALE IQ	104	SPEECH	PASS

PERSONAL-SOCIAL READING

ATTENTION	6	WORD ANALYSIS	2.8
ACTIVITY	7	VOCABULARY	2.4
SOCIAL	5	COMPREHENSION	2.2

SIMULATION FACTOR MODEL 2

THE NUMBER OF THIS DATA PROFILE IS 3

CHRONOLOGICAL AGE IS 7 YEARS AND 9 MONTH(S)

GRADE LEVEL IS 2

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	83	HEARING	PASS
PERFORMANCE IQ	85	VISION	PASS
FULL SCALE IQ	82	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	2	WORD ANALYSIS	1.7
ACTIVITY	4	VOCABULARY	0.3
SOCIAL	2	COMPREHENSION	2.1

SIMULATION FACTOR MODEL 2

THE NUMBER OF THIS DATA PROFILE IS 4

CHRONOLOGICAL AGE IS 7 YEARS AND 2 MONTH(S)

GRADE LEVEL IS 2

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	90	HEARING	PASS
PERFORMANCE IQ	103	VISION	PASS
FULL SCALE IQ	96	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	5	WORD ANALYSIS	3.0
ACTIVITY	3	VOCABULARY	1.6
SOCIAL	1	COMPREHENSION	1.2

SIMULATION FACTOR MODEL 2

THE NUMBER OF THIS DATA PROFILE IS 5

CHRONOLOGICAL AGE IS 7 YEARS AND 5 MONTH(S)

GRADE LEVEL IS 2

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	80	HEARING	FAIL
PERFORMANCE IQ	96	VISION	PASS
FULL SCALE IQ	86	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	4	WORD ANALYSIS	2.0
ACTIVITY	2	VOCABULARY	0.6
SOCIAL	4	COMPREHENSION	1.5

SIMULATION FACTOR MODEL 2

THE NUMBER OF THIS DATA PROFILE IS 6

CHRONOLOGICAL AGE IS 8 YEARS AND 1 MONTH(S)

GRADE LEVEL IS 3

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	99	HEARING	PASS
PERFORMANCE IQ	96	VISION	PASS
FULL SCALE IQ	97	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	4	WORD ANALYSIS	3.2
ACTIVITY	5	VOCABULARY	2.2
SOCIAL	4	COMPREHENSION	2.2

SIMULATION FACTOR MODEL 2

THE NUMBER OF THIS DATA PROFILE IS 7

CHRONOLOGICAL AGE IS 8 YEARS AND 5 MONTH(S)

GRADE LEVEL IS 3

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	107	HEARING	PASS
PERFORMANCE IQ	93	VISION	PASS
FULL SCALE IQ	99	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	6	WORD ANALYSIS	4.5
ACTIVITY	6	VOCABULARY	2.9
SOCIAL	5	COMPREHENSION	2.7

SIMULATION FACTOR MODEL 2

THE NUMBER OF THIS DATA PROFILE IS 8

CHRONOLOGICAL AGE IS 7 YEARS AND 2 MONTH(S)

GRADE LEVEL IS 2

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	117	HEARING	PASS
PERFORMANCE IQ	111	VISION	PASS
FULL SCALE IQ	115	SPEECH	FAIL

PERSONAL-SOCIAL		READING	
ATTENTION	7	WORD ANALYSIS	3.0
ACTIVITY	4	VOCABULARY	4.3
SOCIAL	7	COMPREHENSION	2.6

SIMULATION FACTOR MODEL 2

THE NUMBER OF THIS DATA PROFILE IS 9
CHRONOLOGICAL AGE IS 6 YEARS AND 8 MONTH(S)
GRADE LEVEL IS 1

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	98	HEARING	PASS
PERFORMANCE IQ	91	VISION	FAIL
FULL SCALE IQ	94	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	6	WORD ANALYSIS	1.5
ACTIVITY	6	VOCABULARY	1.5
SOCIAL	5	COMPREHENSION	0.3

SIMULATION FACTOR MODEL 2

THE NUMBER OF THIS DATA PROFILE IS 10

CHRONOLOGICAL AGE IS 6 YEARS AND 3 MONTH(S)

GRADE LEVEL IS 1

PSYCHOLOGICAL		SCREENING	
VERBAL IQ	80	HEARING	PASS
PERFORMANCE IQ	102	VISION	PASS
FULL SCALE IQ	90	SPEECH	PASS

PERSONAL-SOCIAL		READING	
ATTENTION	5	WORD ANALYSIS	0.5
ACTIVITY	5	VOCABULARY	0.1
SOCIAL	6	COMPREHENSION	1.4

NUMBER OF PROFILES GENERATED = 10

NUMBER OF FACTORS USED TO GENERATE PROFILES = 11

VARIABLE	MEAN IN	SD IN	MEAN OUT	SD OUT
1	100.000	15.000	96.600	12.233
2	100.000	15.000	95.800	8.410
3	50.000	10.000	55.500	10.893
4	50.000	10.000	53.200	9.724
5	50.000	10.000	55.600	13.669
6	5.000	2.000	4.700	1.616
7	5.000	2.000	4.500	1.509
8	5.000	2.000	4.300	1.676
9	2.000	1.000	2.216	1.161
10	2.000	1.000	1.768	1.212
11	2.000	1.000	1.893	0.740

CORRELATION MATRIX: UPPER TRIANGLE CONTAINS FACTOR DERIVED CORRELATIONS AND LOWER TRIANGLE CONTAINS DATA DERIVED CORRELATIONS.

1	1.00	0.60	0.40	0.10	0.20	0.20	0.10	0.20	0.40	0.60	0.50
2	0.20	1.00	-0.00	0.20	0.20	0.30	0.10	0.20	0.30	0.50	0.40
3	0.23	-0.40	1.00	-0.00	0.40	0.20	-0.00	-0.00	0.30	0.30	0.30
4	0.45	0.49	0.23	1.00	0.00	0.20	0.20	0.20	0.40	0.40	0.40
5	0.08	-0.56	0.36	0.11	1.01	0.10	0.20	0.10	0.10	0.10	0.10
6	0.49	0.76	-0.24	0.29	-0.52	1.00	0.40	0.40	0.20	0.20	0.20
7	0.41	0.09	0.21	0.11	0.10	0.52	1.00	0.40	0.10	0.10	0.10
8	0.48	0.39	-0.17	0.56	-0.30	0.59	0.42	1.00	0.10	0.10	0.10
9	0.41	0.06	0.63	0.27	-0.05	0.18	-0.10	-0.11	1.00	0.50	0.50
10	0.94	0.42	0.19	0.52	-0.12	0.60	0.28	0.45	0.59	1.00	0.50
11	0.43	0.24	0.42	0.62	0.12	0.15	0.28	0.22	0.51	0.54	1.00

FACTOR SCORE INPUT

1	0.75	0.26	0.14	-0.38	-0.11	0.20	-0.14	0.34	-0.34	0.26	0.24
2	0.66	0.04	-0.11	-0.61	0.16	-0.26	0.12	-0.05	0.04	0.09	-0.25
3	0.45	0.31	0.62	0.37	-0.25	0.15	0.01	0.07	0.13	0.11	-0.21
4	0.50	-0.15	-0.51	0.43	0.36	0.05	0.19	0.11	0.22	0.22	0.03
5	0.31	-0.03	0.73	0.05	0.54	-0.14	0.20	-0.03	-0.06	-0.09	0.11
6	0.51	-0.53	0.09	0.06	-0.44	-0.41	0.13	-0.02	0.22	-0.04	0.13
7	0.33	-0.71	0.13	0.10	0.18	-0.02	-0.56	0.01	-0.07	0.05	-0.07
8	0.37	-0.68	0.03	-0.15	-0.11	0.49	0.31	-0.01	-0.12	-0.09	-0.04
9	0.69	0.16	-0.17	0.34	-0.14	-0.19	0.08	0.03	-0.54	0.02	-0.03
10	0.77	0.26	-0.18	-0.06	0.04	0.07	-0.13	0.41	0.11	-0.32	0.02
11	0.72	0.24	-0.18	0.13	0.03	0.12	-0.11	-0.56	0.11	-0.16	0.02

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